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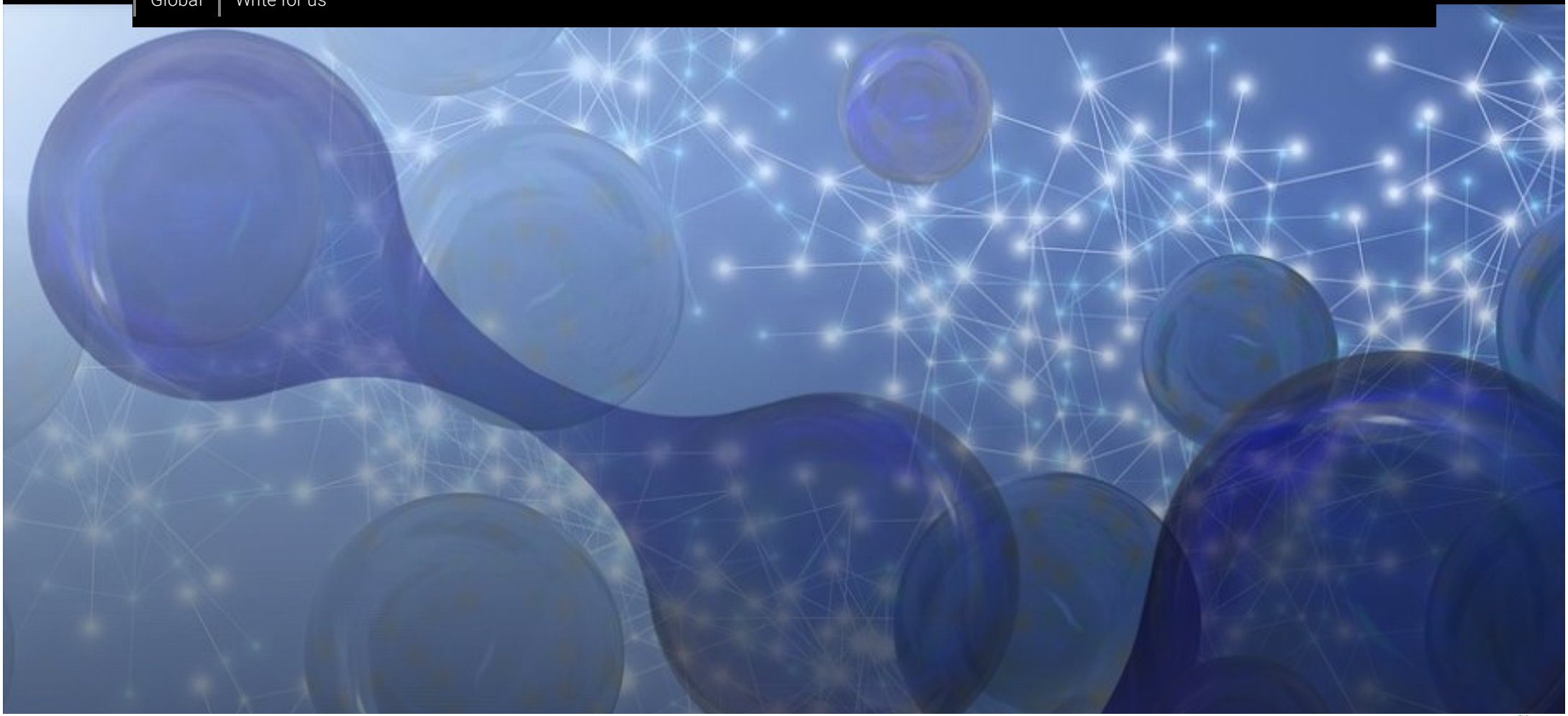

IS RUSSIA 'HELPING' EU GREEN NEW DEAL ? THE GREEN HYDROGEN SCENARIO.

Luciano Magaldi / 30/06/2022 / 0

As the world moves towards a zero-emission future, Russia, one of the world's largest exporters of fossil fuels, is facing a war against Ukraine for its geopolitcal reasons and interests. Now, the entire 'Gazprom-addicted' Europe is being in some energy-related troubles – the Old Continent's future will rely heavily on diversifying its economy, including decarbonizing its energy sector. New economic concerns emerge for significant oil and gas importers, including the EU Member States, as more and more of them have to establish net-zero targets and adopt decarbonization policies. These dangers are already being debated in the EU Institutions, but there is currently no clear strategy in place to address them.

The costs of variable renewables like solar photovoltaics and wind power-generation have been divided by around 10 and 3, respectively, in the last ten years. When new power-generating capacities are compared, they now offer the lowest costs for bulk electricity in many nations. Building a new solar plant is less expensive in some nations, such as China and India, than burning coal in existing plants. However, as power becomes increasingly decarbonized thanks to nearly limitless solar and wind resources around the world, electrification of buildings, industry, and transportation is critical to their decarbonization. Electrification will promote considerable energy efficiency improvements by itself, because to the increased efficiency of heat pumps and electric motorization. Renewable heat from geothermal or solar devices, as well as biomass combustion, will be part of the solution, but their role will be constrained by costs, convenience, geographic availability, and, in the case of biomass, potential conflicts with food production, biodiversity, and land and water use.

Because of its potential to store and supply significant amounts of energy without emitting CO2 during burning, hydrogen has been recognized as one of the sources that could help with decarbonization. Hydrogen, in particular, has the potential to play a critical role in the decarbonization of energy-intensive industries such as aviation and maritime transportation, as well as steel and chemicals. Some analysts believe hydrogen will play a significant role in the global energy mix in the future, while others are more skeptical. What is known, however, is that the increased usage of this energy vector will have significant geopolitical ramifications around the world, with the ability to redraw the energy, economic, social, and security maps.

Hydrogen, or more specifically dihydrogen (H2), is frequently touted as the 'clean energy of the future'. However, hydrogen is currently used primarily to transform and purify oil products, as well as as a feedstock for the production of ammonia and methanol, two major chemical inputs. Electrolysis produces only a small amount of hydrogen – less than 5% – as a by-product of the chlor-alkali process, which feeds chlorine to the industry. 'Green hydrogen' produced by renewable water electrolysis is becoming more competitive with 'blue hydrogen' produced from fossil fuels and carbon capture and storage, as well as 'grey hydrogen' produced from fossil fuels and large CO2 emissions. Electrolysers do not need to run 24 hours a day, 7 days a week to create green hydrogen at competitive prices, contrary to popular assumption, because the majority of the cost comes from electricity, provided the load factor is at least 30%.

Green hydrogen will be critical in decarbonizing the chemical and steel sectors, particularly in the production of ammonia, methanol, and naphta, as well as the reduction of iron ores. Oil products can help to lower their GHG footprint as long as they are used. Hydrogen serves as an input or a process agent in all of these tasks, not as an energy fuel in the traditional sense. Energy is used in industry as electricity or heat at varying temperatures, and there is no reason why a variety of electric technologies cannot be used to provide it to all operations. Compact high-temperature heat storage is being developed, and it will soon be able to convert variable electricity fluxes into constant heat fluxes for a fraction of the cost of electric batteries.

Green hydrogen will also create hydrogen-based fuels for some industries that are difficult to electrify, such as maritime transportation and aviation. 'Green ammonia' appears to be the maritime transport industry's primary choice, as it is a carbon-free fuel that may be utilized in current large ships' Diesel engines with little changes. Flying needs fuels with the maximum energy content

possible, both in terms of volume and weight. The two viable possibilities are biofuels and synfuels, however due to the limitations of sustainable biofuels, synfuels are the most likely workhorse of sustainable aircraft. To become really carbon-neutral, however, the carbon atoms they contain must come from the air, either directly or indirectly through biomass: by mixing biomass with green hydrogen, one may extract three times more sustainable fuel from any given amount of biomass.

Given the increased efficiency of battery electric vehicles and ongoing battery advances, green hydrogen is unlikely to ever play a significant role in ground transportation. To fuel a vehicle with hydrogen rather than a battery, two to three times more green electricity is required. There are few compelling reasons to choose hydrogen fuel-cell vehicles over battery-electric vehicles for personal vehicles and light-duty trucks. Heavy-duty cars, coaches, and trains, maybe with a fuel cell as a 'range-extender' attached to battery, have a slightly better chance of using hydrogen.

Despite this, the costs of hydrogen compression, storage, transportation, and distribution are significant. This is not the only choice, either. Various countries are testing electric road systems using catenaries or one conductive rail in the ground. Synfuels might be imported for road users and used to power these 'range-extenders' from nations with abundant renewable resources. Poorer production, transportation, and distribution costs would compensate for even lower return efficiency. The use of hydrogen in buildings for low-temperature heat – such as space heating, sanitary water, and cooking – appears even less justified. For every kWh of green power consumed, electric heat pumps deliver 3 or more kWh of heat, but the full hydrogen chain would only deliver 0,5 kWh for the same beginning output.

Green hydrogen will also play a part in the power industry, where it will be used for long-term storage and then supplied to the grid as energy using huge fuel cells or gas turbine combustion. Because of its low 'return efficiency', this job is likely to be confined to ensuring 'electrical security'. Large seasonal imbalances will be addressed mostly by using the proper mix of resources to match demand changes – solar in hot climates, wind in temperate climates. Pumped-storage hydropower, compact heat storage and turbines, and batteries will be used to address demand-supply mismatches.

Finally, green hydrogen will facilitate a new energy trade from nations with abundant and low-cost resources to others with high demand and limited resources. When these choices are available, hydrogen can be stored affordably in subsurface saline cavities and delivered in pipes. Otherwise, it

will be manufactured close to its place of application, such as for the manufacturing of chemical feedstocks and fuels that are easily accessible from land and ships.

Today, the European continent is significantly reliant on Russian fossil fuel supplies. In this European energy transition scenario, the EU State Members will have to drastically reduce this reliance in its efforts to decarbonize the economy, enhance energy efficiency, electrify buildings, industry, and transportation, and create indigenous renewable energy capacities. The European Union will have to maximize its investments and diversify its suppliers by importing essential hydrogen-rich feedstocks and fuels from other nations — particularly those on the Mediterranean Sea's south shore — and by assisting them in developing the necessary technology.

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